**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

SINGULAR COMPUTING LLC,

     Plaintiff,

v.

GOOGLE LLC,

     Defendant.

C.A. No. 1:19-cv-12551-FDS

Hon. F. Dennis Saylor IV

**DEFENDANT GOOGLE LLC'S MEMORANDUM OF LAW IN SUPPORT OF ITS
MOTION FOR FURTHER CLAIM CONSTRUCTION UNDER _O2 MICRO_**

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I.   **INTRODUCTION**

A fundamental dispute underlies much of the parties' recent briefing: can one of the claimed "execution units" overlap with another execution unit? This dispute was crystalized during briefing on Google's motion for summary judgment of noninfringement, which argued that "no shared circuitry" can be "part of more than one" execution unit. Dkt. 527 at 9. Singular argued the opposite. Dkt. 505 at 8-10. But the overlapping-elements dispute has come up in other contexts as well. Ever since Singular's expert Dr. Khatri opined that one rounder can be part of *128* different execution units, Google has repeatedly challenged that opinion as inconsistent with the language of the claims. *See, e.g.*, Dkt. 409 at 9 n.3 (arguing that one cannot "count the same piece of hardware multiple times to meet the numerosity requirement" of the claims); Dkt. 525 at 1-3 (explaining how Dr. Khatri engages in improper claim construction), 5 (arguing Dr. Khatri's opinion improperly "counts key components … multiple times"). And Singular has steadfastly defended its interpretation of the claim language. *E.g.*, Dkt. 505 at 8.

This fundamental dispute is one of claim construction, not fact. It turns on the meaning of the phrase "execution unit" in the asserted claims and, more particularly, on whether the processing elements that qualify as execution units (under the parties' agreed-upon construction) may overlap or must be discrete. Nothing about this question requires looking at the accused products or assessing what components they contain. Singular effectively concedes this point, asking the Court "to explicitly reject" Google's "improper construction of the term 'processing element.'" Dkt. 500 at 6. And throughout their papers, Google and Singular raise classic claim-construction arguments in support of their respective positions. *Compare, e.g.*, Dkt. 505 at 8 (arguing that "Google's arguments are inconsistent with the specification") *with* Dkt. 527 at 8 (arguing that Singular's arguments are "not condoned by the specification"). In fact, this claim-construction question lies at the heart of the parties' dispute. Singular evaded invalidity (at least temporarily)

for the asserted claims before the Patent Trial and Appeal Board (PTAB) *only* by relying on the "exceeds" limitation, which requires that the number of LPDHR units exceed by a *specific, defined amount*, the number of 32-bit execution units.[1] But now Singular can *only* read that limitation onto the accused products by distorting the claimed "execution units" such that they can physically overlap, thereby permitting the same circuitry to count as more than one "unit," effectively nullifying this numerosity limitation. Without its improper construction, Singular's entire infringement case collapses.[2]

It is therefore "the court's duty" to resolve this "dispute regarding the scope" of the claimed execution units. *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008). If the question were left to be tried to a jury, the verdict may be vacated on appeal. *Id.* To avoid that outcome, Google requests further construction of "execution units."

Specifically, the claim language prohibits one execution unit (i.e., processing element) from overlapping with another. At bottom, the relevant processing elements are claimed as "execution *units*," and a "unit" must be distinct from all other units of the same type. Moreover, as detailed below, allowing units to overlap would be inconsistent with both the broader intrinsic record and the uniform extrinsic evidence. The Court should clarify its prior construction to explain that a claimed "execution unit" cannot overlap with any other execution unit, construing that term to mean a "*physically distinct* processing element comprising an arithmetic circuit paired with a memory circuit." (emphasis on language added to prior construction, *see* Dkt. 354 at 25).

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[1] All other challenged claims, including those previously asserted in this case, were invalidated.

[2] To be clear, if the Court (incorrectly) allowed for overlapping execution units, that would not be *sufficient* for infringement, as the accused products do not infringe for several other reasons as well.

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II.   **BACKGROUND**

Singular claims that two versions of Google's Tensor Processor Units (TPUv2 and TPUv3)

infringe claim 53 of U.S. Patent No. 8,407,273 and claim 7 of U.S. Patent No. 9,218,156. These

patents share a written description and have been treated as indistinguishable when construing

their shared claim terms. *See* Dkt. 354.

The full text of the asserted claims is set out elsewhere, *e.g.*, Dkt. 461 at 6-7, but for

purposes of this motion, it suffices to say that both asserted claims require a device containing a

number of "LPHDR ***execution units***" that "exceeds by at least one hundred the non-negative

integer number of ***execution units*** in the device adapted to execute at least the operation of

multiplication on floating point numbers that are at least 32 bits." *See* '273 patent at claim 53

(emphases on relevant term, which appears in claim 43, a claim on which claim 53 depends).[3]

Singular has repeatedly characterized this limitation as the "key" invention of the asserted patents,

relying on it as the sole ground for avoiding invalidation before the PTAB. *E.g.*, *Google LLC v.*

Singular Computing LLC, No. IPR2021-00179, Paper 56 at 29:2-17, 52:18-24 (P.T.A.B. May 14,

2021) ("IPR Hearing Tr."); *id.* at Paper 57 at 74-75 ("Final Written Decision") (declining to hold

claim 53 unpatentable based on the "exceeds" limitation); *see also* Dkt. 521 at 2 (relying on

"exceeds" limitation to avoid patent ineligibility).[4]

The Court construed the phrase "execution unit" once before. Early in this case, the parties

agreed the claimed "execution unit" was a "processing element," but disputed (among other things)

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[3] As a shorthand, this motion refers to that limitation as the "exceeds limitation," and the latter
execution units as "32-bit execution units." This shorthand is not a comment on what is or is not
required to satisfy this limitation, nor how the limitation applies to the facts.

[4] The PTAB ought to have held this claim, and all other claims in the asserted patents, are
unpatentable as explained in Google's appeal briefs.

whether that processing element must be "paired with a memory circuit." Dkt. 354 at 18-25.

Singular argued that a memory circuit is required, and Google argued that Singular's construction

imported a limitation into the asserted claims, thereby rendering an unasserted dependent claim

superfluous. *Id.* at 18. The Court sided with Singular, reasoning that "[t]he specification uses the

term 'processing element' as though it were a tangible object" that is "paired with a memory

circuit," rejecting Google's argument that the "execution unit" term encompassed software.[5] *Id.*

at 22-23. In so doing, the Court explained how the phrase "paired with a memory circuit" is broad

enough to encompass both a memory circuit that is part of (i.e., local to) the execution unit and

that is not part of (e.g., coupled to) the execution unit. *Id.* at 18-19 & n.5. Neither the parties nor

the Court explored the relationship among processing elements, including whether one physical

circuit component could be part of several physical processing elements.

Then, as Singular's infringement theory shifted, Dr. Khatri offered an infringement opinion

built upon an unexpected and previously undisclosed understanding of LPHDR "processing

elements." *Compare* Dkt. 410-4 (Supplemental Infringement Contentions, which never mention

rounders or a two-stage operation), *with* Dkt. 505 at 3 (arguing Dr. Khatri offered a theory based

on unique pairs of rounders). As explained by Singular, Dr. Khatri opined that each accused

LPHDR processing element includes (i) two "rounder[s]" and (ii) a "multiplier circuit." Dkt. 505

at 3. Those rounders, however, are not unique to a single LPHDR processing element under

Dr. Khatri's theory; rather, he contends that "each individual rounder is shared across several

multipliers," meaning the same rounder is part of 128 different processing elements. *Id.* at 6. Only

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[5] Notably, Google's proposed construction here would be consistent with a claim that encompasses software, as "software is often referred to as having units." Dkt. 161 at 51:15 (Markman Hearing Tr.). In all events, once the claims have been interpreted to require tangible objects, the intrinsic and extrinsic records require Google's construction.

by counting in this way could Dr. Khatri opine that the accused TPUs meet the exceeds limitation. *See id.* at 4. By Dr. Khatri's own count, the accused products contain 8,200 32-bit execution units, but only (at most) 4,096 rounders. Because (under Dr Khatri's theory), each LPHDR execution unit requires two physical rounders, without the gamesmanship of counting one physical rounder multiple times, Dr. Khatri would be able to identify no more than 2,048 of those units (4,096 divided by 2). That would fall far short of the quantity necessary to show the number of LPHDR execution units exceeds, by at least one hundred, the number of 32-bit execution units (i.e., 8,200). That is, without its strained interpretation, Singular cannot show Google's products practice the "key" inventions in its patents. IPR Hearing Tr. at 52:18-24.

Ever since Singular served Dr. Khatri's infringement report, Google has argued that Singular's infringement theory is inconsistent with the claim language:

- **Motion to Strike Dr. Khatri Report**: One cannot "legitimately count the same piece of hardware multiple times to meet the numerosity requirement" of the asserted claims. Dkt. 409 at 9 n.3.

- **Motion for Summary Judgment of Non-Infringement**: "[N]o shared circuitry is part of more than one" execution unit in the specification. Dkt. 527 at 9. *See generally* Dkt. 461, 527.

- **Dr. Khatri *Daubert* Motion**: "[W]here the Court did describe a processing element in its Claim Construction Order, Dr. Khatri's opinions are inconsistent with that description." Dkt. 525 at 5-6; *cf.* Dkt. 480 at 3 (arguing Dr. Khatri's opinions are inconsistent with the Court's prior construction on a slightly different point).

At every turn, Singular defended its understanding of the claim language, even asking for an "explicit[]" construction in its favor. Dkt. 500 at 6 (Opposition to Khatri *Daubert* Motion); *see also* Dkt. 505 (Opposition to Summary Judgment Motion). Indeed, Singular had to defend its interpretation in order to maintain **any** infringement case.

This dispute has been, and will continue to be, central to adjudicating infringement. The Court has already denied Google's motion for summary judgment, which turned on this claim-

construction dispute, but it is not clear from the record whether the Court disagreed with Google's interpretation of the claim language. *See* Dkt. 552 at 11:4-12 (oral order denying summary judgment motion based on "genuine disputes of material fact"); *id.* at 12:11-14. And as Singular acknowledges, this claim construction dispute bears on Google's still-pending motion to exclude Dr. Khatri's opinions. *See* Dkt. 500 at 6. Accordingly, the dispute must be resolved.

III.   LEGAL STANDARDS

"When the parties present a fundamental dispute regarding the scope of a claim term, it is the court's duty to resolve it." *O2 Micro*, 521 F.3d at 1362. A jury cannot be asked to adjudicate "arguments regarding the meaning and legal significance" of claim terms. *Id.* Because judges are "better suited" for that task, it is assigned to them. *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 388 (1996). Hence, when claim construction disputes are left for the jury, the Federal Circuit has not hesitated to vacate the jury's verdict and order a retrial. *E.g.*, *O2 Micro*, 521 F.3d at 1362; *Eon Corp. IP Holdings v. Silver Spring Networks*, 815 F.3d 1314, 1319 (Fed. Cir. 2016).

Claim construction starts with the "language of the asserted claim itself." *Comark Commc'ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1186 (Fed. Cir. 1998). That language should be read in light of the specification, which is "the single best guide to the meaning of a disputed term." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (en banc). "In addition to consulting the specification," courts "should also consider the patent's prosecution history, if it is in evidence." *Id.* at 1317. And a court should look to any extrinsic evidence "it deems helpful" in understanding the claim terms. *Id.* at 1318. An apparatus claim covers what a "device *is*, not what [that] device *does*." *E.g.*, *Hewlett-Packard Co. v. Bausch & Lomb, Inc.*, 909 F.2d 1464, 1468 (Fed. Cir. 1990).

IV.   ARGUMENT

Singular's contention that the phrase "execution unit" allows for units that overlap lacks any support. Both the intrinsic and extrinsic record demonstrate that the ***physical*** execution units must be distinct and non-overlapping.

A.   Overlapping Processing Elements Are Inconsistent with the Claim Language and Written Description

Ample evidence in the intrinsic record establishes one execution unit, i.e., a processing element, cannot overlap with another execution unit. This alone suffices to require adoption of Google's proposed construction. *See, e.g.*, *Seabed Geosolutions (US) Inc. v. Magseis FF LLC*, 8 F.4th 1285, 1287 (Fed. Cir. 2021) ("If the meaning of a claim term is clear from the intrinsic evidence, there is no reason to resort to extrinsic evidence.").

1.   The Meaning of the Word "Units" Prevents Overlap Between Processing Elements

Claim construction is primarily aimed at assessing the "ordinary and customary meaning" of the disputed claim term. *See Thorner v. Sony Comput. Ent. Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (noting that the plain meaning controls absent disclaimer or lexicography). Here, the relevant term is "execution unit," and the word "unit" denotes separate, non-overlapping components.

In ordinary parlance, a "unit" is an individual thing that is regarded as single and complete (i.e., self-contained and distinct). Consider, for example, an "apartment unit" within an apartment building. Each building resident is afforded their own private space walled off from others'—that is, their "unit." This "apartment unit" does not overlap with or encompass any other resident's "apartment unit." Indeed, when separate residences overlap, common parlance employs different terminology—like a "suite" for several college dorms with overlapping common space. As another example, imagine the same apartment building is advertised as having "ten washer/dryer

units." But in reality, there are only five washers to be used in conjunction with ten dryers. No one would say that the five washers could be "shared" among the ten dryers to create the promised "ten washer/dryer units." At best, the apartment has five "washer/dryer units" and five other dryers.

Throughout the written description, "unit" is used in precisely the same way. The '273 patent describes and depicts a host of different "units." *E.g.*, '273 patent at 8:48-49 ("control unit"), 9:7 ("I/O unit"), 10:62-63 ("logic unit"). In each case, the "unit" described is a discrete, self-contained component. *See id.* The described units might be "connected," "share[] data," or contain subcomponents. *E.g.*, *id.* at 16:31-17:2 (describing general embodiment). But no "unit" overlaps with another "unit" of the same type. The control and input/output units shown in Figure 1 adhere to this rule:
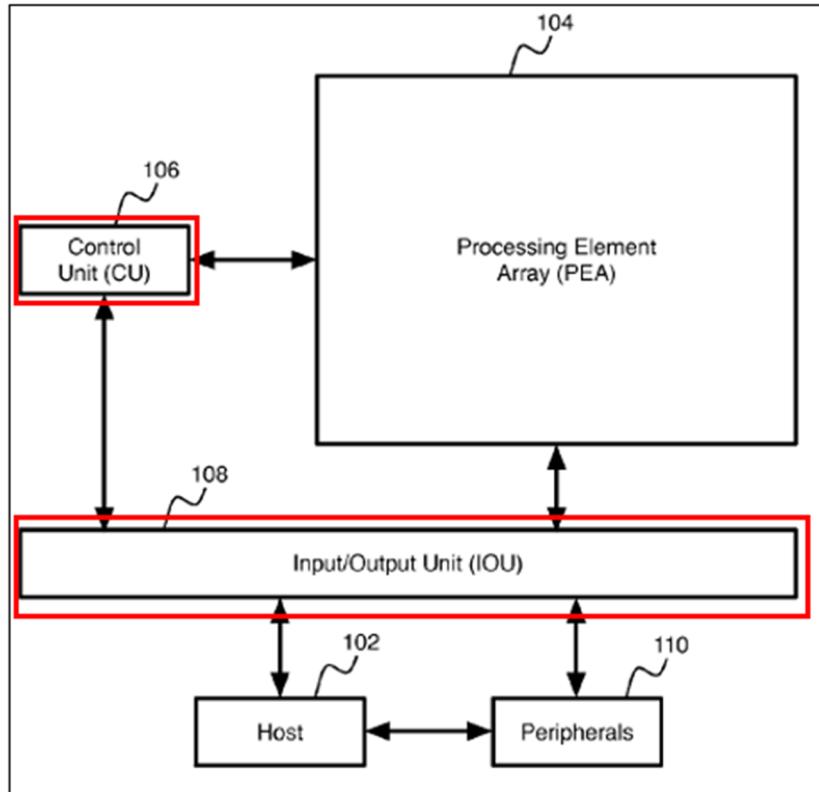
So too the "logic unit **406**" and "LPHDR arithmetic unit **408**" within the processing element **400** shown in Figure 4:
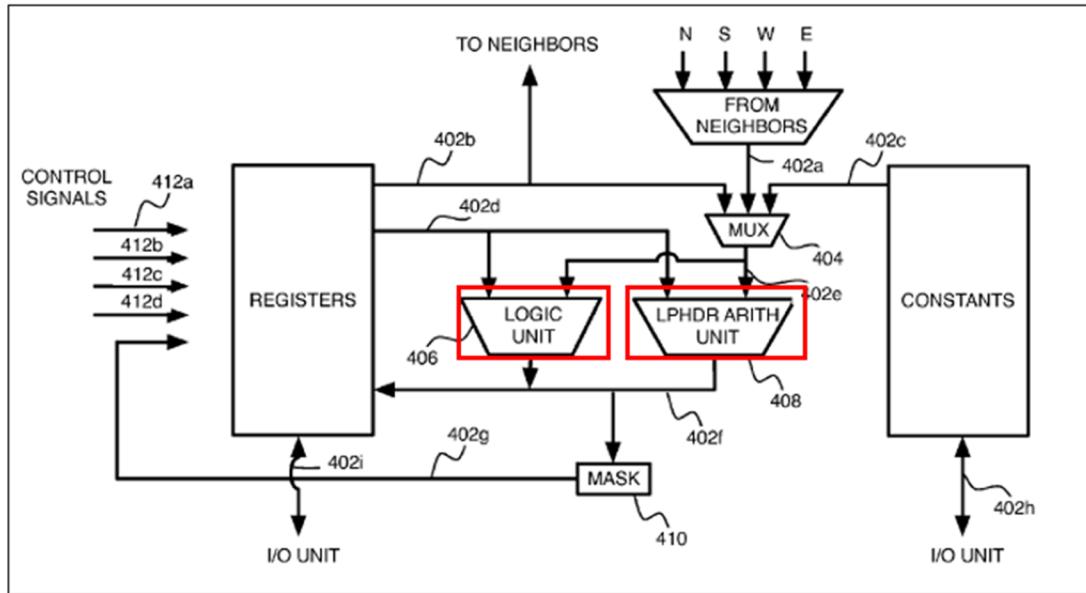
By contrast, for the rare case in which "share[d] circuitry" performs distinct functions, that circuitry is depicted as a "single combined" unit.   '273 patent at 13:39-43.   A single adder/subtractor **604** (red box) performs "the special function for ADD" and "a similar function for SUB," *id.*, but operates as a distinct component from any other circuit component (e.g., the multiplier **606**) within the LPHDR arithmetic unit **408**:
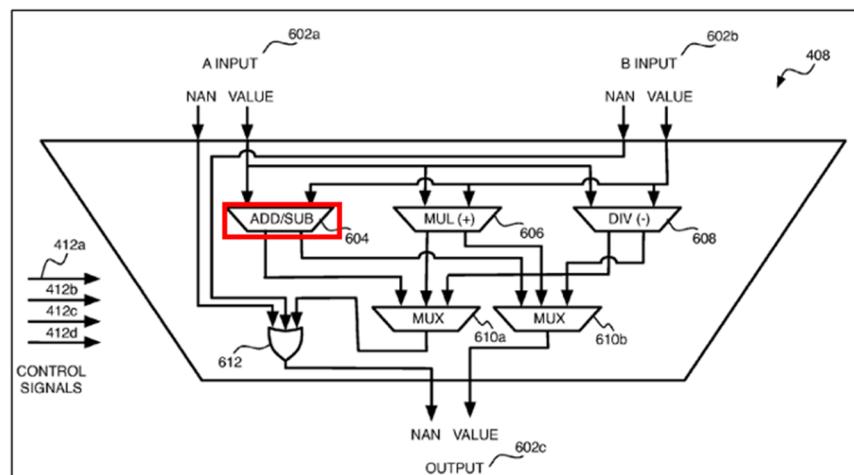
'273 patent at FIG.6, 13:42-60.

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Nothing in the specification suggests that "execution unit" ought to be treated differently. In fact, the written description discloses several non-overlapping processing elements arranged in an array:
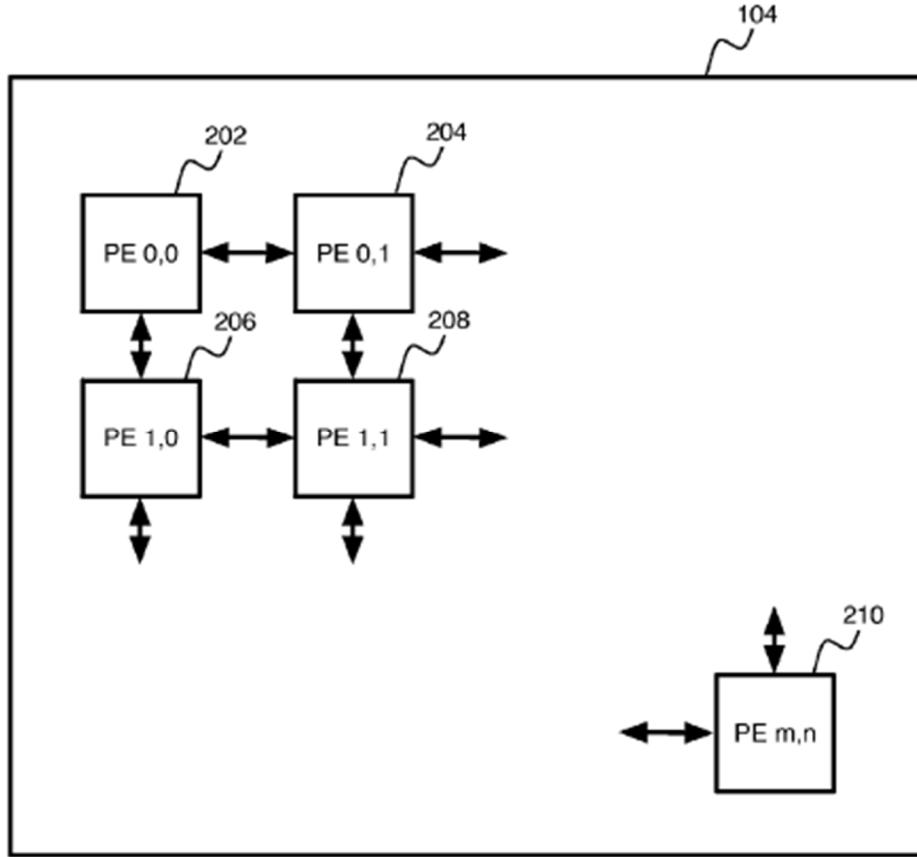
'273 patent at FIG. 2. Each of these processing elements can "access data from or send data to" other processing elements, but no processing element comprises any component or circuitry contained within another "unit." *See id.* at 9:45-54. Instead, the processing elements are "connected" to their neighboring units, *id.* at FIG. 3, 9:55-10:8, which are "***other*** parts" of the processor, *id.* at 2:48-51 (describing FIG. 3) (emphasis added). This is consistent with the patent's description of "***each*** unit" as "***a*** Processing Element," rather than some conglomeration of components that might be overlapping and might count as more than one execution unit. *Id.* at 16:54-56 (emphases added); *see also, e.g., id.* at 3:50 ("Each element has ***its own*** memory.")

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(emphasis added), 10:58 ("Each PE needs to operate on its local data."), 11:6-17 ("[E]ach PE"

resets "its Mask **410**," a memory bit with a flagging function, based on certain conditions in "that

PE.").   And it is consistent with this Court's construction of "execution units" as tangible

components. Dkt. 354 at 22. It would be illogical for two physical ***units*** to overlap.

To be clear, a set of nonoverlapping "units" may still be connected to some other shared

structure. The apartment building described above supplies a straightforward example. On any

given floor of that building, there are several apartment "units," none of which overlap. Each of

those apartment units has its own door to a shared hallway. But no one would say the hallway is

part of each "unit" or that each apartment floor is actually one "unit" because all the apartments

open into the hallway. The washer/dryer example is similar. Certainly, each washer/dryer unit

independently connects to the electrical system, but that does not make the washer-dryer pairs any

less of a "unit" that is physically distinct from other washer-dryer pairs. In the same way, a group

of nonoverlapping "execution units" may be "paired with" a single non-local memory without

constituting overlapping execution units. *See* Dkt. 494-1 (Leeser Rep.) ¶¶ 160, 165 (opining on

invalidity consistent with the Court's "paired with" construction); *cf.* Dkt. 354 at 25 (requiring

execution units to "comprise" an arithmetic unit, but only be "paired with" a memory circuit); Dkt.

161 ("Markman Tr.") at 5:16 (counsel for Singular, arguing that "'paired' means connected,

obviously").

In sum, the specification contains no examples of overlapping "execution units"—or any

other overlapping unit—let alone a clear redefinition of "unit" sufficient to overcome that term's

ordinary usage. *See, e.g., Thorner*, 669 F.3d at 1365. Instead, the patentee has consistently

depicted and described every "unit" as a distinct piece of non-overlapping hardware. That compels

adoption of Google's proposed construction.

> 2.   *Overlapping Processing Elements Are Inconsistent with the "Exceeds"*
>   *Limitation*

The exceeds limitation, which Singular has described as the patents' "key" inventions, lends further support to Google's proposed construction. Determining whether that limitation is met can be thought of as including two steps: first counting both LPHDR and 32-bit "execution units," and then comparing the resulting counts to see whether there are at least 100 more LPHDR execution units than 32-bit execution units. Neither step is understandable or logical if "execution units" can overlap. *See* Markman Tr. at 46:17-19 (the Court, relying on a numerosity limitation, i.e., "non-negative integer number of execution units," as support for understanding the claims to require "physical thing[s]").

Once a single component can be included within multiple execution units (LPHDR or 32-bit), there is no principled basis for defining the precise "units" in a specific circuit, let alone a principled way of comparing their number to that of another set of units as is required by the exceeds limitation. One LPHDR execution unit that performs thousands of LPHDR operations could be treated as ***thousands*** of LPHDR execution units with overlapping circuitry. This would render meaningless the "exceeds" limitation—the only basis for patentability Singular could identify. *See* IPR Hearing Tr. at 52:18-24 (arguing the "exceeds" limitation was the "key invention"). It also represents clear backtracking on Singular's ***own*** argument that the LPHDR execution units are tangible—an argument which the Court adopted and replied upon when granting Singular's motion for summary judgment of no ineligibility. *See* Dkt. 354 at 22-23 (construing LPHDR execution unit as "tangible" object); Dkt. 552 at 9 (holding claims are directed to "computer architecture," i.e., physical components); Dkt. 521 at 2 (arguing claims recite "concrete" limitations to avoid patent ineligibility). As explained in Google's summary judgment briefing, Singular is essentially counting the number of LPHDR operations an accused product can

perform, but an apparatus claim covers what a "device *is*, not what [that] device *does*." *E.g.*, *Hewlett-Packard*, 909 F.2d at 1468.

To see why there is no meaningful way to count *physical* "execution units" that may overlap, consider the simplified circuit below, which is based loosely on Singular's interpretation of the claim language as applied in Dr. Khatri's report:
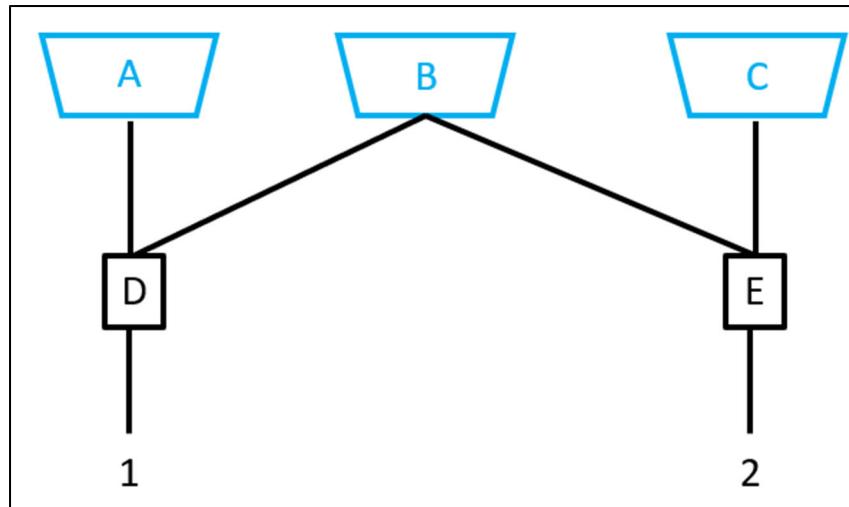
This circuit contains five physical components (A, B, C, D, and E) and produces two outputs (1 and 2). Components A and B feed into component D, which then performs an operation resulting in output 1. Component B and C feed into component E, which then performs an operation resulting in output 2. In this example, both output 1 and output 2 represent the outputs of a LPHDR operation.

Singular would argue that, under its construction, this circuit includes two LPHDR execution units, both of which include component B. But there is no way to identify (i.e., count) *two tangible* circuits that represent those "units." *See* Dkt. 354 at 25 (construing an "execution unit" as "tangible" hardware). It is not enough to count the two distinct outputs 1 and 2—that just means the circuit shown can perform two LPHDR *operations*. The Court has construed the "execution unit" to be a tangible component—i.e., an apparatus—so any infringement theory must

turn on what the accused product is, not what it does. *Hewlett-Packard*, 909 F.2d at 1468. Nor is

it enough, as Singular might argue, to point to boxes (green and purple) drawn around the

components used to ***produce*** the two outputs:
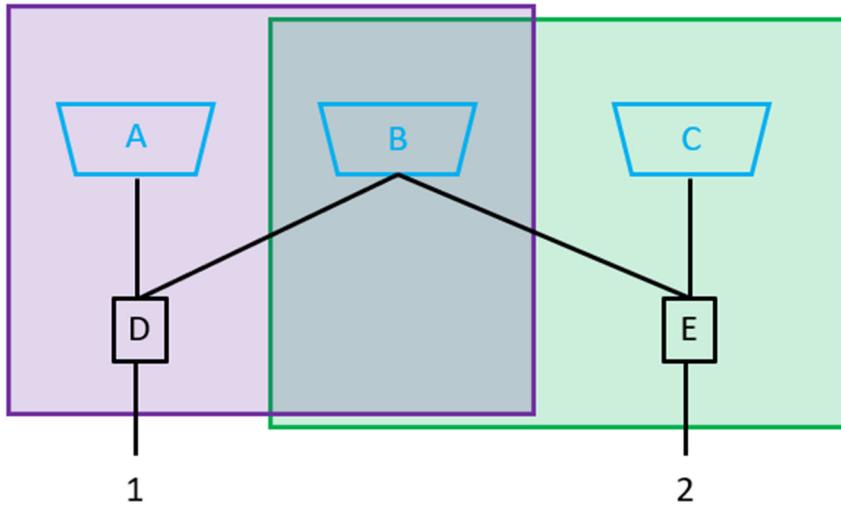
These are "virtual" concepts overlaid on tangible components. Dkt. 542 (MSJ Hearing Tr.) at

12:4-8 (explaining how Singular's theory is based on "virtual" units); Dkt. 354 at 21-22

(concluding that "execution units" are not "abstract concept[s]"). There is no ***physical*** structure

corresponding to the purple and green boxes in this simplified diagram, so they cannot be counted

as ***physical*** execution units. In the end, the fact that component B is reused limits the figure to

containing just ***one*** tangible "unit" of components. Component B cannot be split in two, assigning

one physical part to one circuit and one physical part to the other. This reveals Singular's

interpretation of the claim language as nothing more than an attempt to backtrack on its own

argument that "execution units" must be physical components. *See* Markman Tr. at 8:6-7 (Counsel

for Singular, arguing that "[t]he claim, as you can read, is directed to an execution unit. That's a

thing."); Dkt. 521 at 2 (arguing claims recite "concrete" limitations to avoid patent ineligibility).

Simple counting and comparing of physical processing elements ought not lead to such

illogical results. And Singular cannot escape its own representations, adopted by this Court and

the PTAB, that were necessary to preserve (at least temporarily) the validity of the asserted claims. This is strong evidence supporting a prohibition on overlapping processing elements (i.e., execution units).

        3.   *Dependent Claims Requiring "Locally Connected" Processing Elements Prevent Those Elements from Sharing Circuitry*

Additionally, certain dependent claims require LPHDR execution units that are "locally connected" to one another. *E.g.*, '273 patent at claim 19. These limitations, and their written description support, would make little sense if processing elements could overlap.

It is well established that claims reciting one component "connected" to another require physically distinct structures. *E.g.*, *Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249, 1254 (Fed. Cir. 2010); *Regents of Univ. of Minn. v. AGA Med. Corp.*, 717 F.3d 929, 936 (Fed. Cir. 2013). The word "connected" must bear some meaning. *Cf. In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1280 (Fed. Cir. 2015) (interpreting "attached" in the same way).

Nothing in the specification suggests Dr. Bates intended to depart from this well-established rule. The written description discloses a single overarching embodiment—a processing element array (PEA) in a SIMD computing system—with a few implementation variations. *See* '273 patent at FIGS. 1-4. The PEA (shown and discussed above in § IV.A.1) contains a number of ***physically distinct*** "processing elements" connected to one another to form the array. '273 patent at FIG. 2. Nothing in the specification suggests these "connected" processing elements may overlap.

Indeed, a skilled artisan would have no way of determining whether overlapping processing elements were "locally connected." Imagine, again, that the figure below shows two LPHDR processing elements that both contain component B:
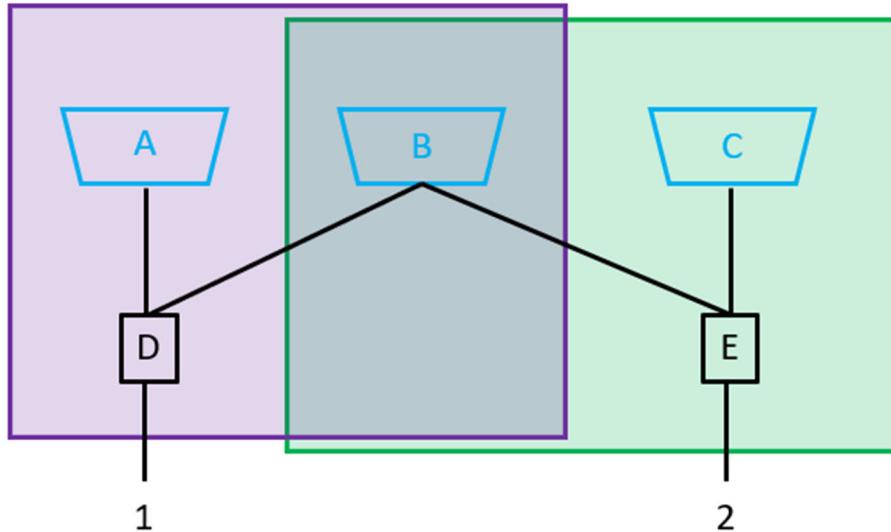
In addition to the problems created when a skilled artisan attempts to count the "execution units" in this figure, *see supra* § IV.A.2, a skilled artisan would be unable to discern whether these units are "locally connected." In one sense, the two virtual LPHDR execution units (purple and green boxes) are "locally connected" because those boxes overlap. But there is no ***physical*** connection between them, despite this Court's instruction that LPHDR execution units are tangible, not virtual, components. *See* Dkt. 354 at 22 (holding the execution unit is a "tangible" object). As a result, there would be serious indefiniteness concerns under Singular's construction, which militates in favor of Google's construction. *See Rhine v. Casio, Inc.*, 183 F.3d 1342, 1345 (Fed. Cir. 1999) ("[C]laims should be so construed, if possible, as to sustain their validity.").

>   4.   *The Patentee's Own Statements About His "Invention" Preclude Overlapping Processing Elements*

Finally, throughout the intrinsic record, Dr. Bates claims that a key feature of his "invention" provides significant benefits by allowing for "massively parallel" use of LPHDR execution units. *Google LLC v. Singular Computing LLC*, No. IPR2021-00179, Paper 56 at 52:18-24 (P.T.A.B. May 14, 2021) (IPR Hearing Tr.); *see also* '273 patent at 6:51-55, 7:5-11, 24:19-24. This, too, supports Google's construction. *E.g.*, *Pacing Techs., LLC v. Garmin Int'l, Inc.*, 778

F.3d 1021, 1024 (Fed. Cir. 2015) (holding that statements about the "present invention" bind a patentee and collecting cases); *cf. Aylus Networks, Inc. v. Apple Inc.*, 856 F.3d 1353, 1360 (Fed. Cir. 2017) (holding that disclaimer principles apply to statements made during inter partes review).

Importantly, the statements about parallelism in the intrinsic record are not limited to the benefits of parallel *functions*. They extend instead to the benefits of parallel *hardware*. The written description asserts that "[t]he discovery that massive amounts of LPHDR arithmetic is useful … can be an advantage in any (massively or non-massively) *parallel machine design*." '273 patent at 24:19-24 (emphasis added); *see id.* at 25:36. This includes the preferred SIMD design, which includes "many small simple execution units" driven "in parallel." *Id.* at 3:53-56.

Parallel structures are, by their terms, independent of one another. "Parallel" lines never intersect, even if carried out to infinity. The same is true of the processing elements depicted in the written description: none of them overlaps in any circumstance. *See supra* § IV.A.1. Again, this is strong support for Google's proposed construction.

<center>*   *   *</center>

All told, the intrinsic evidence points entirely in Google's favor. The plain meaning of "unit," claim language surrounding the "execution unit" term, and uniform language in the written description all prevent the claimed execution units (i.e., processing elements) from overlapping. Since the meaning of the claims is clear from the intrinsic record, the Court need look no further; it should adopt Google's proposed construction.

B.   Extrinsic Evidence Supports Construing "Unit" as Requiring Non-Overlapping Components

The extrinsic evidence also supports Google's position. A reference that discusses "processing elements," entered into the record by Google, establishes that one processing element

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cannot overlap with another. And the only expert testimony in the record on the plain meaning of "processing element," Dr. Walker's report, is in accord.

During claim construction in this case, Google provided a textbook describing "processing elements" as performing "simple, memoryless mappings." Dkt. 134-2 at 5. The textbook goes on to describe how it "may be advantageous to merge" multiple processing elements into "one PE [processing element] with multiple inputs and outputs." *Id.* That is, when multiple processing elements are merged by overlapping their circuitry, the resulting component is one "large PE," not several overlapping processing elements. *Id.*

Moreover, the only expert testimony in the record establishes that processing elements cannot overlap. As explained in Google's *Daubert* motion challenging Dr. Khatri's opinions (Dkt. 480), Dr. Khatri does not proffer any plain meaning of "processing element," instead engaging in impermissible claim construction. Dr. Walker, on the other hand, explained in detail how Dr. Khatri's infringement theory is inconsistent with the plain meaning of "processing element." Dkt. 481-1 ¶¶ 24, 214-227. In his deposition, for example, Dr. Walker explained why the circuits Dr. Khatri identifies cannot be physically distinct. Dkt. 480-2 (Walker Depo.) at 107:20-24 ("I have a problem with saying that they are distinct circuits because they are not distinct. There—***there's overlap between them***.") (emphasis added). This follows from the plain and ordinary meaning of "unit" as used in the claim language.

V.   CONCLUSION

In sum, the Court should clarify that the claimed execution units cannot overlap, construing the claimed "execution unit" to mean a "***physically distinct*** processing element comprising an arithmetic circuit paired with a memory circuit."   (emphasis on language added to prior construction, *see* Dkt. 354).

Respectfully submitted,

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I certify that this document is being filed through the Court's electronic filing system, which serves counsel for other parties who are registered participants as identified on the Notice of Electronic Filing (NEF). Any counsel for other parties who are not registered participants are being served by first class mail on the date of electronic filing.

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